

PCT COOPERATION TRE.

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 22 June 2001 (22.06.01)	
International application No. PCT/GB00/03816	Applicant's or agent's file reference I13662WO-LH/sd
International filing date (day/month/year) 04 October 2000 (04.10.00)	Priority date (day/month/year) 08 October 1999 (08.10.99)
Applicant RIDDOCH, Henry	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

02 May 2001 (02.05.01)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Olivia TEFY Telephone No.: (41-22) 338.83.38
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PARIET COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HOARTON, L., D., C.
Forrester Ketley & Co.
Forrester House
52 Bounds Green Road
London N11 2EY
ROYAUME-UNI

Date of mailing (day/month/year) 28 January 2002 (28.01.02)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference I13662WO-LH/sd	
International application No. PCT/GB00/03816	International filing date (day/month/year) 04 October 2000 (04.10.00)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input type="checkbox"/> the inventor	<input type="checkbox"/> the agent
<input type="checkbox"/> the common representative		
Name and Address NMB (UK) LIMITED 1 Sterling Centre Eastern Road Bracknell Berkshire RG12 2PW United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input checked="" type="checkbox"/> the person	<input type="checkbox"/> the name	<input type="checkbox"/> the address
<input type="checkbox"/> the nationality	<input type="checkbox"/> the residence	
Name and Address MINEBEA CO., LTD. 4106-73, Oaza Miyota Miyota-machi, Kitasaku-gun, Nagano 389-0206 Japan	State of Nationality JP	State of Residence JP
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned	
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer R. Chrem
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 April 2001 (19.04.2001)

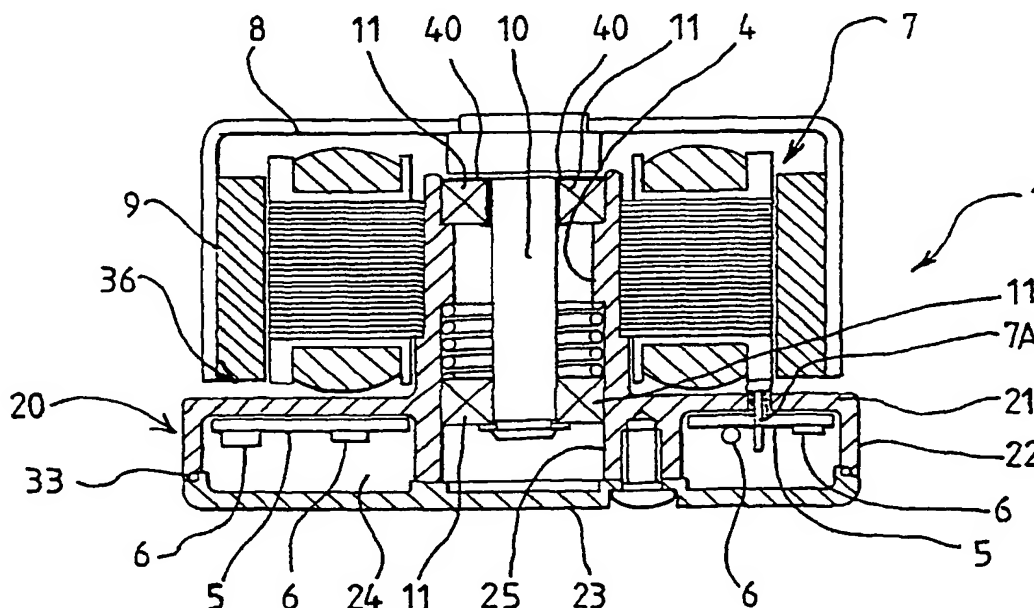
PCT

(10) International Publication Number
WO 01/28074 A2

- (51) International Patent Classification⁷: **H02K 19/00**
- (21) International Application Number: **PCT/GB00/03816**
- (22) International Filing Date: **4 October 2000 (04.10.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
9923900.6 8 October 1999 (08.10.1999) **GB**
- (71) Applicant (for all designated States except US): **NMB (UK) LIMITED [GB/GB]; 1 Sterling Centre, Eastern Road, Bracknell, Berkshire RG12 2PW (GB).**
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **RIDDOCH, Henry [GB/GB]; 3 The Kyles, Wemyss Bay, Renfrewshire PA18 6AF (GB).**
- (74) Agent: **HOARTON, L., D., C.; Forrester Ketley & Co., Forrester House, 52 Bounds Green Road, London N11 2EY (GB).**
- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).**
- Published:
— Without international search report and to be republished upon receipt of that report.

[Continued on next page]

(54) Title: **AN EXTERNAL ROTOR BRUSHLESS DC MOTOR**



(57) Abstract: An external rotor brushless DC motor for use in a fan, or other similar application, the motor comprising: a stator assembly base having a base plate; a number of stator windings affixed to the stator assembly base; and circuitry associated with the motor, wherein the base plate is disposed between the circuitry and the stator windings.

WO 01/28074 A2



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference I13662WO-LH/sd	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 03816	International filing date (day/month/year) 04/10/2000	(Earliest) Priority Date (day/month/year) 08/10/1999
Applicant NMB (UK) LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☒ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/00/03816

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H02K29/00 H02K11/04 H02K9/22 H02K7/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 41 22 529 A (BOSCH GMBH ROBERT) 14 January 1993 (1993-01-14) column 2, line 31 - line 34; figure 1 column 3, line 12 - line 18; figure 1 Claim 7	6,11, 17-22, 24,25, 27,30,32
Y	column 3, line 31 - line 36; figure 3 column 2, line 34 - line 51; figure 1	1,2,4,5, 7,8,13, 23,26, 28,33-37 12,29,31
A	---	-/--

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

1 June 2001

Date of mailing of the international search report

1. 06. 01

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Zoukas, E

INTERNATIONAL SEARCH REPORT

International Application No

PCT/90/03816

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 982 125 A (SHIRAKAWA HIROYUKI) 1 January 1991 (1991-01-01) column 1, line 64 - line 68	1,2,4,5, 7,8,13, 23
A	Abstract column 2, line 37 - line 41; figures 1,2 ---	13
Y	PATENT ABSTRACTS OF JAPAN vol. 015, no. 277 (E-1089), 15 July 1991 (1991-07-15) & JP 03 093440 A (DAIKIN IND LTD), 18 April 1991 (1991-04-18) abstract	26,28
A	---	12,31
Y	US 4 682 065 A (MARRACINO CHARLES R ET AL) 21 July 1987 (1987-07-21)	33-37
A	figure 2 ---	14-16
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 12, 31 October 1998 (1998-10-31) & JP 10 191595 A (CALSONIC CORP), 21 July 1998 (1998-07-21) abstract	14-16
A	---	
A	DE 198 12 729 A (BOSCH GMBH ROBERT) 30 September 1999 (1999-09-30) Abstract figure 3 ---	14-16
A	EP 0 688 093 A (ELECTRO PARTS SPA) 20 December 1995 (1995-12-20) figure 1 ---	9,10, 14-16
A	US 4 818 907 A (SHIROTORI YOZO) 4 April 1989 (1989-04-04) Abstract figure 1 ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 010, no. 141 (E-406), 24 May 1986 (1986-05-24) & JP 61 004435 A (MITSUBISHI DENKI KK), 10 January 1986 (1986-01-10) abstract	17
A	---	
A	US 5 049 769 A (REINHARDT WILHELM ET AL) 17 September 1991 (1991-09-17) figure 1 ---	17,18
A	GB 2 050 525 A (PLOT LTD C) 7 January 1981 (1981-01-07) page 1, line 88 - line 91; figure 1 -----	23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 00/03816

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

An external rotor brushless DC motor for use in a fan, or other similar application, the motor comprising: a stator assembly base having a base plate (21); a number of stator windings (7) affixed to the stator assembly base; and circuitry (5,6) associated with the motor, wherein the base plate (21) is disposed between the circuitry and the stator windings.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1,2,4,5,7-10,13-16

2. Claims: 17-37,3,6,11,12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP00/03816

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4122529 A	14-01-1993	FR 2679076 A IT 1280026 B JP 5199722 A	15-01-1993 23-12-1997 06-08-1993
US 4982125 A	01-01-1991	JP 1321853 A DE 3919321 A KR 9110201 B	27-12-1989 04-01-1990 20-12-1991
JP 03093440 A	18-04-1991	JP 2570432 B	08-01-1997
US 4682065 A	21-07-1987	NONE	
JP 10191595 A	21-07-1998	NONE	
DE 19812729 A	30-09-1999	WO 9949554 A EP 1023759 A	30-09-1999 02-08-2000
EP 0688093 A	20-12-1995	IT T0940500 A DE 69512570 D DE 69512570 T ES 2140582 T	18-12-1995 11-11-1999 25-05-2000 01-03-2000
US 4818907 A	04-04-1989	NONE	
JP 61004435 A	10-01-1986	JP 1664807 C JP 3028144 B	19-05-1992 18-04-1991
US 5049769 A	17-09-1991	DE 3842588 A FR 2642582 A GB 2227891 A,B	21-06-1990 03-08-1990 08-08-1990
GB 2050525 A	07-01-1981	NONE	

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference I13662WO-LH/sd	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/03816	International filing date (day/month/year) 04/10/2000	Priority date (day/month/year) 08/10/1999
International Patent Classification (IPC) or national classification and IPC H02K19/00		
Applicant MINEBEA CO., LTD. et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 02/05/2001	Date of completion of this report 24.01.2002
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Kugler, D Telephone No. +49 89 2399 2866 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03816

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-10 as originally filed

Claims, No.:

1-32 as received on 21/12/2001 with letter of 21/12/2001

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03816

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
☒ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☐ all parts.
☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-32
	No:	Claims	
Inventive step (IS)	Yes:	Claims	15-32
	No:	Claims	1-14

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03816

Industrial applicability (IA) Yes: Claims 1-32
 No: Claims

2. Citations and explanations
see separate sheet

Re Item IV

Lack of unity of invention

The IPEA considers that the present application contains 2 inventions. The reasons therefore are the same as these set out by the ISA (see Form PCT/ISA/206(extra sheet) dated 15.01.01).

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents cited in the international search report:

- D1: DE 41 22 529 A (BOSCH GMBH ROBERT) 14 January 1993 (1993-01-14)
- D2: PATENT ABSTRACTS OF JAPAN vol. 1998, no. 12, 31 October 1998 (1998-10-31) & JP 10 191595 A (CALSONIC CORP), 21 July 1998 (1998-07-21)
- D3: US-A-4 682 065 (MARRACINO CHARLES R ET AL) 21 July 1987 (1987-07-21)
- D4: US-A-4 818 907 (SHIROTORI YOZO) 4 April 1989 (1989-04-04)

1. Document D1 (see figure 1) discloses an external rotor brushless DC motor comprising:
 - a stator assembly base having a base plate 16;
 - a winding assembly 22 affixed to the stator assembly base; and
 - circuitry 58 associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly and is provided with a cover 52 to define an enclosure 56, the circuitry 58 being located between the base plate and the cover within the enclosure.

The subject-matter of claim 1 differs from that prior art by the fact that the cover is **hermetically sealed**. According to document D1 a shaft 26 extends through an opening provided in the cover 52 without any sealing means being provided.

The subject-matter of claim 1 is therefore new. The requirements of Article 33(2)

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/03816

PCT are fulfilled.

It would be obvious for the skilled person to provide the motor according to D1 with a hermetically sealed cover when this would be required because a closed cover for an external rotor brushless DC motor is known from document D2 (see figure 2, cover 18). As the shaft 4 does not extend through the cover of the enclosure, a certain amount of airtightness is provided even if this is not explicitly mentioned in the abstract of the document. The provision of a hermetically sealed cover is a very general feature which is a common measure used by the skilled person. Document D4 discloses a motor which differs from the motor according to claim 1 only by the fact that it has no cover for the enclosure but that motor is provided with sealing means for the electronic circuit.

The subject-matter of claim 1 is therefore not inventive. The requirements of Article 33(3) PCT are not fulfilled.

2. Dependent claims 2 -13 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:

claim 2: see D1, figure 1; D2, figure 2,

claim 3: see D1, column 3, lines 6 to 18,

claim 4: see D1, sidewall 48 in figure 1,

claim 5: see D1; figure 1, "column 14",

claim 6: see D1, column 3, lines 6 to 18; by the fact that the high power dissipating components are in tight contact with the base plate, it is obvious for the skilled person to manufacture the stator from a thermally conductive material,

claim 7: see D1, figure 1, column 3, lines 18 to 20,

claim 8: see D1, figure 1,

claim 9: see D2, figure 2,

claim 10: it is common practice to position components on both surfaces of the printed circuit board,

claim 11: see D1, column 2, line 60 to column 3, line 3,

claim 12: see D1, column 2, line 60 to column 3, line 3, figures 2 to 5,

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference I13662WO-LH/sd	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/03816	International filing date (day/month/year) 04/10/2000	Priority date (day/month/year) 08/10/1999
International Patent Classification (IPC) or national classification and IPC H02K19/00		
Applicant MINEBEA CO., LTD. et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 02/05/2001	Date of completion of this report 24.01.2002
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Kugler, D Telephone No. +49 89 2399 2866



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03816

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-10 as originally filed

Claims, No.:

1-32 as received on 21/12/2001 with letter of 21/12/2001

Drawings, sheets:

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03816

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
☒ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☐ all parts.
☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-32
	No:	Claims	
Inventive step (IS)	Yes:	Claims	15-32
	No:	Claims	1-14

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03816

Industrial applicability (IA) Yes: Claims 1-32
 No: Claims

2. Citations and explanations
see separate sheet

Re Item IV

Lack of unity of invention

The IPEA considers that the present application contains 2 inventions. The reasons therefore are the same as these set out by the ISA (see Form PCT/ISA/206(extra sheet) dated 15.01.01).

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents cited in the international search report:

- D1: DE 41 22 529 A (BOSCH GMBH ROBERT) 14 January 1993 (1993-01-14)
- D2: PATENT ABSTRACTS OF JAPAN vol. 1998, no. 12, 31 October 1998 (1998-10-31) & JP 10 191595 A (CALSONIC CORP), 21 July 1998 (1998-07-21)
- D3: US-A-4 682 065 (MARRACINO CHARLES R ET AL) 21 July 1987 (1987-07-21)
- D4: US-A-4 818 907 (SHIROTORI YOZO) 4 April 1989 (1989-04-04)

1. Document D1 (see figure 1) discloses an external rotor brushless DC motor comprising:
 - a stator assembly base having a base plate 16;
 - a winding assembly 22 affixed to the stator assembly base; and
 - circuitry 58 associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly and is provided with a cover 52 to define an enclosure 56, the circuitry 58 being located between the base plate and the cover within the enclosure.

The subject-matter of claim 1 differs from that prior art by the fact that the cover is **hermetically sealed**. According to document D1 a shaft 26 extends through an opening provided in the cover 52 without any sealing means being provided.

The subject-matter of claim 1 is therefore new. The requirements of Article 33(2)

PCT are fulfilled.

It would be obvious for the skilled person to provide the motor according to D1 with a hermetically sealed cover when this would be required because a closed cover for an external rotor brushless DC motor is known from document D2 (see figure 2, cover 18). As the shaft 4 does not extend through the cover of the enclosure, a certain amount of airtightness is provided even if this is not explicitly mentioned in the abstract of the document. The provision of a hermetically sealed cover is a very general feature which is a common measure used by the skilled person. Document D4 discloses a motor which differs from the motor according to claim 1 only by the fact that it has no cover for the enclosure but that motor is provided with sealing means for the electronic circuit.

The subject-matter of claim 1 is therefore not inventive. The requirements of Article 33(3) PCT are not fulfilled.

2. Dependent claims 2 -13 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:
- claim 2: see D1, figure 1; D2, figure 2,
 - claim 3: see D1, column 3, lines 6 to 18,
 - claim 4: see D1, sidewall 48 in figure 1,
 - claim 5: see D1, figure 1, "column 14",
 - claim 6: see D1, column 3, lines 6 to 18; by the fact that the high power dissipating components are in tight contact with the base plate, it is obvious for the skilled person to manufacture the stator from a thermally conductive material,
 - claim 7: see D1, figure 1, column 3, lines 18 to 20,
 - claim 8: see D1, figure 1,
 - claim 9: see D2, figure 2,
 - claim 10: it is common practice to position components on both surfaces of the printed circuit board,
 - claim 11: see D1, column 2, line 60 to column 3, line 3,
 - claim 12: see D1, column 2, line 60 to column 3, line 3, figures 2 to 5,

claim 13: see D1, figure 6.

3. Claim 14 is not inventive as as the motor according to document D1 is intended to drive a fan (see D1, column 1, lines 58 to 61).
4. Document D1 (see figure 1) discloses a fan having incorporating an external rotor brushless DC motor comprising:
 - a stator assembly base having a base plate 16;
 - the stator assembly base being manufactured from a thermally conductive material (D1, column 3, lines 6 to 18; by the fact that the high power dissipating components are in tight contact with the base plate, it is obvious for the skilled person to manufacture the stator from a thermally conductive material)
 - a winding assembly 22 affixed to the stator assembly base; and
 - circuitry 58 associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly (see figure 1), and has a side wall 48 depending away from the winding assembly, the side wall 48 being within the air flow generated, in use, by the fan and comprising part of a heat transfer path to dissipate heat away from the motor (column 3, lines 31 to 39).

The subject-matter of claim 17 differs from that prior art in that the fan is provided with a **frame manufactured from a plastics material**. The subject-matter of claim 17 is therefore new. The requirements of Article 33(2) PCT are fulfilled.

Although document D3 discloses a fan manufactured from molded plastic material the available prior art does not suggest to provide a fan with a combination of thermally conductive material and plastic material in the way as defined in claim 1. The subject-matter of claim 1 is therefore inventive. The requirements of Article 33(3) PCT are fulfilled.

5. Dependent claims 15, 16 and 18 to 32 refer back to independent claim 17. These claims are also considered as new and inventive.

No objections are raised with respect to industrial applicability.

REPLACED BY
ART 34 ~~AMDT~~MS:

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1. An external rotor brushless DC motor comprising:
a stator assembly base having a base plate;
a winding assembly affixed to the stator assembly base; and
circuitry associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly and is provided with a cover to define an enclosure, the circuitry being located between the base plate and the cover within the enclosure which is hermetically sealed.
2. A motor according to Claim 1, wherein the circuitry is attached to or supported by the base plate.
3. A motor according to Claim 1, wherein the heat generating components of the circuitry are attached to the base plate.
4. A motor according to any preceding claim, wherein the base plate comprises a base plate having a side wall, the side wall defining a recess within which the circuitry is located.
5. A motor according to any preceding claim, wherein the stator assembly base include means for supporting the winding assembly.
6. A motor according to any preceding claim, wherein the stator assembly base is manufactured from aluminium or other thermally conductive material.
7. A motor according to any preceding claim, wherein the circuitry is in the form of a printed circuit board having a plurality of components mounted thereon.

8. A motor according to Claim 10, wherein some or all of the components on the printed circuit board are positioned on the opposite surface of the printed circuit board to that adjacent the base plate.
9. A motor according to Claim 10, wherein some or all of the components are positioned on the surface of the printed circuit board adjacent the base plate.
10. A motor according to Claim 10, wherein the components are positioned on both surfaces of the printed circuit board.
11. A motor according to any preceding claim, wherein high heat generating components overhang the edge of the printed circuit board and attach directly to the base plate hence conducting heat away from the component into the base plate.
12. A motor according to any preceding claim, wherein high heat generating components are located proximal an aperture in the printed circuit board, a projection from the base plate contacting at least one component through the aperture to conduct heat away from the component into the base plate.
13. A motor according to any preceding claim, wherein the winding assembly comprises a number of multipole stator laminations with windings.
14. A fan incorporating a motor according to any preceding claim.
15. A fan according to Claim 17 having a frame, wherein the frame is manufactured from a plastics material.

16. A fan according to Claim 17 or 18, wherein the motor has a cover plate and the cover plate comprises a part of the fan housing.
17. An external rotor brushless DC motor comprising:
 - a stator assembly base having a base plate;
 - a winding assembly affixed to the stator assembly base; and
 - circuitry associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly, and has a side wall depending away from the winding assembly, the side wall comprising part of a heat transfer path to dissipate heat away from the motor.
18. A motor according to Claim 17, wherein the circuitry is attached to or supported by the base plate.
19. A motor according to Claim 17, wherein the heat generating components of the circuitry are attached to the base plate.
20. A motor according to any one of Claims 17 to 19, wherein the side wall defines a recess within which the circuitry is located.
21. A motor according to any one of Claims 17 to 20, wherein the base plate is provided with a cover, the circuitry being located between the base plate and the cover.
22. A motor according to any one of Claims 17 to 21, wherein the circuitry is housed within an enclosure.

23. A motor according to Claim 22, wherein the enclosure is hermetically sealed.
24. A motor according to any one of Claims 17 to 23, wherein the stator assembly base include means for supporting the winding assembly.
25. A motor according to any one of Claims 17 to 24, wherein the stator assembly base is manufactured from aluminium or other thermally conductive material.
26. A motor according to any one of Claims 17 to 25, wherein the circuitry is in the form of a printed circuit board having a plurality of components mounted thereon.
27. A motor according to Claim 26, wherein some or all of the components on the printed circuit board are positioned on the opposite surface of the printed circuit board to that adjacent the base plate.
28. A motor according to Claim 26, wherein some or all of the components are positioned on the surface of the printed circuit board adjacent the base plate.
29. A motor according to Claim 26, wherein the components are positioned on both surfaces of the printed circuit board.
30. A motor according to any one of Claims 17 to 29, wherein high heat generating components overhang the edge of the printed circuit board and attach directly to the base plate hence conducting heat away from the component into the base plate.

31. A motor according to any one of Claims 17 to 30, wherein high heat generating components are located proximal an aperture in the printed circuit board, a projection from the base plate contacting at least one component through the aperture to conduct heat away from the component into the base plate.

32. A motor according to any one of Claims 17 to 31, wherein the winding assembly comprises a number of multipole stator laminations with windings.

33. A fan incorporating a motor according to any one of Claims 17 to 32.

34. A fan according to Claim 33 having a frame, wherein the frame is manufactured from a plastics material.

35. A fan according to Claim 33 or 34, wherein the motor has a cover plate and the cover plate comprises a part of the fan housing.

36. A fan according to any one of Claims 33 to 35, wherein the side wall is within the air flow generated, in use, by the fan.

37. A fan for generating an airflow, the fan having a fan housing and an external rotor brushless DC motor, the motor comprising: a stator assembly base having a base plate; a winding assembly affixed to the stator assembly base; and circuitry associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly and has a side wall depending away from the winding assembly, the side wall comprising part of a heat transfer path away from the motor and being within the airflow generated, in use, by the fan.

claim 13: see D1, figure 6.

3. Claim 14 is not inventive as the motor according to document D1 is intended to drive a fan (see D1, column 1, lines 58 to 61).
4. Document D1 (see figure 1) discloses a fan having incorporating an external rotor brushless DC motor comprising:
 - a stator assembly base having a base plate 16;
 - the stator assembly base being manufactured from a thermally conductive material (D1, column 3, lines 6 to 18; by the fact that the high power dissipating components are in tight contact with the base plate, it is obvious for the skilled person to manufacture the stator from a thermally conductive material)
 - a winding assembly 22 affixed to the stator assembly base; and
 - circuitry 58 associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly (see figure 1), and has a side wall 48 depending away from the winding assembly, the side wall 48 being within the air flow generated, in use, by the fan and comprising part of a heat transfer path to dissipate heat away from the motor (column 3, lines 31 to 39).

The subject-matter of claim 17 differs from that prior art in that the fan is provided with a **frame manufactured from a plastics material**. The subject-matter of claim 17 is therefore new. The requirements of Article 33(2) PCT are fulfilled.

Although document D3 discloses a fan manufactured from molded plastic material the available prior art does not suggest to provide a fan with a combination of thermally conductive material and plastic material in the way as defined in claim 1. The subject-matter of claim 1 is therefore inventive. The requirements of Article 33(3) PCT are fulfilled.

5. Dependent claims 15, 16 and 18 to 32 refer back to independent claim 17. These claims are also considered as new and inventive.

No objections are raised with respect to industrial applicability.

JC13 Rec'd PCT/PTO 04 APR 2002

CLAIMS:

1. An external rotor brushless DC motor comprising:
a stator assembly base having a base plate;
a winding assembly affixed to the stator assembly base; and
circuitry associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly and is provided with a cover to define an enclosure, the circuitry being located between the base plate and the cover within the enclosure which is hermetically sealed.
2. A motor according to Claim 1, wherein the circuitry is attached to or supported by the base plate.
3. A motor according to Claim 1, wherein the heat generating components of the circuitry are attached to the base plate.
4. A motor according to any preceding claim, wherein the base plate comprises a base plate having a side wall, the side wall defining a recess within which the circuitry is located.
5. A motor according to any preceding claim, wherein the stator assembly base include means for supporting the winding assembly.
6. A motor according to any preceding claim, wherein the stator assembly base is manufactured from aluminium or other thermally conductive material.
7. A motor according to any preceding claim, wherein the circuitry is in the form of a printed circuit board having a plurality of components mounted thereon.

8. A motor according to Claim 10, wherein some or all of the components on the printed circuit board are positioned on the opposite surface of the printed circuit board to that adjacent the base plate.
9. A motor according to Claim 10, wherein some or all of the components are positioned on the surface of the printed circuit board adjacent the base plate.
10. A motor according to Claim 10, wherein the components are positioned on both surfaces of the printed circuit board.
11. A motor according to any preceding claim, wherein high heat generating components overhang the edge of the printed circuit board and attach directly to the base plate hence conducting heat away from the component into the base plate.
12. A motor according to any preceding claim, wherein high heat generating components are located proximal an aperture in the printed circuit board, a projection from the base plate contacting at least one component through the aperture to conduct heat away from the component into the base plate.
13. A motor according to any preceding claim, wherein the winding assembly comprises a number of multipole stator laminations with windings.
14. A fan incorporating a motor according to any preceding claim.
15. A fan according to Claim 17 having a frame, wherein the frame is manufactured from a plastics material.
16. A fan according to Claim 17 or 18, wherein the motor has a cover plate and the cover plate comprises a part of the fan housing.

17. A fan having a frame manufactured from a plastics material and, incorporating an external rotor brushless DC motor, the motor comprising:
- a stator assembly base having a base plate;
 - the stator assembly base being manufactured from a thermally conductive material;
 - a winding assembly affixed to the stator assembly base; and
 - circuitry associated with the motor, wherein the base plate is disposed between the circuitry and the winding assembly, and has a side wall depending away from the winding assembly, the side wall being within the air flow generated, in use, by the fan and comprising part of a heat transfer path to dissipate heat away from the motor.
18. A fan according to Claim 17, wherein the circuitry is attached to or supported by the base plate.
19. A fan according to Claim 17, wherein the heat generating components of the circuitry are attached to the base plate.
20. A fan according to any one of Claims 17 to 19, wherein the side wall defines a recess within which the circuitry is located.
21. A fan according to any one of Claims 17 to 20, wherein the base plate is provided with a cover, the circuitry being located between the base plate and the cover.
22. A fan according to any one of Claims 17 to 21, wherein the circuitry is housed within an enclosure.

23. A fan according to Claim 22, wherein the enclosure is hermetically sealed.
24. A fan according to any one of Claims 17 to 23, wherein the stator assembly base include means for supporting the winding assembly.
25. A fan according to any one of Claims 17 to 24, wherein the circuitry is in the form of a printed circuit board having a plurality of components mounted thereon.
26. A fan according to Claim 25, wherein some or all of the components on the printed circuit board are positioned on the opposite surface of the printed circuit board to that adjacent the base plate.
27. A fan according to Claim 25, wherein some or all of the components are positioned on the surface of the printed circuit board adjacent the base plate.
28. A fan according to Claim 25, wherein the components are positioned on both surfaces of the printed circuit board.
29. A fan according to any one of Claims 17 to 28, wherein high heat generating components overhang the edge of the printed circuit board and attach directly to the base plate hence conducting heat away from the component into the base plate.
30. A fan according to any one of Claims 17 to 29, wherein high heat generating components are located proximal an aperture in the printed circuit board, a projection from the base plate contacting at least one component through the aperture to conduct heat away from the component into the base plate.

31. A fan according to any one of Claims 17 to 30, wherein the winding assembly comprises a number of multipole stator laminations with windings.

32. A fan according to any one of Claims 17 to 31, wherein the motor has a cover plate and the cover plate comprises a part of the fan housing.